THE Somerset County Education Committee announce that three Senior County Scholarships will be offered for competition in June 1894. They will be tenable for two years in the scientific or technical department of a university college, the Royal College of Science, South Kensington, or some other college or institution approved by the County Education Committee. The annual value of each scholarship will be from £50 to £60, according to the place of instruction chosen, and, subject to the maximum limit, will be fixed at a sum sufficient to cover the cost of instruction, together with £30 per annum toward's the scholar's maintenance. The competition will be open to any boy whose parents or guardians are *bonâ fide* residents in the administrative county of Somerset, and who has regularly attended any secondary school (public or private) within the county for two school years preceding August 1, 1894, provided that every candidate is over 15 and under 17 years of age on July 1, 1894, and that his parents are in receipt of an income of not more than £400 a year from all sources. Six intermediate County Scholarships will also be offered for competition in June 1894. They are of the annual value of £30, and will be tenable for two years at some public secondary school approved for the purpose by the County Committee.

SCIENTIFIC SERIALS.

American Journal of Science, February.—On the chemical composition of staurolite, and the regular arrangement of its carbonaceous inclusions, by S. L. Penfield and J. H. Pratt. A careful analysis of several specimens gave the formula $HAL_6FeSi_2O_{13}$, which may be written as a basic orthosilicate. The aluminium is partly replaced by ferric iron, and the ferrous iron by magnesium and manganese. Basal sections of the rhombic prism show the carbonaceous inclusions to be disposed in the form of a rhombus parallel to the outline, with the corners joined together. This figure develops into a simple cross towards the centre, whereas towards the ends the rhombus widens out until it coincides with the outline. This proves that the inclusions are arranged in the surface of a double pyramid with its apex in the centre, and also in planes joining the edges of this pyramid with those of the prism.—Additional species of pleistocene fossils from Winthrop, Mass., by R. E. Dodge. Three more species of preglacial shells have been found in the drumlin in Boston Harbour, known as Winthrop Great Head. They are *Lunatia Grœnlandica*, Stimpson, *Scapharca transversa*, Adams, and *Buccinum undatum*, Linné. These fossils give additional evidence of the higher temperature of Massachusetts Bay in pre-glacial as compared with the present time.—On the basalts of Kula, by H. S. Washington. These basalts occur near Kula, about 125 km. east by north of Smyrna, where they from cones and streams of a fresh and unaltered appearance. The lavas are to be classed as hornblende-plagioclase basalts, distinguished by the constant presence and great relative quantity of the hornblende, its peculiar magmatic alteration, the small quantity of both plagioclase and olivine, and the large amount of glass basis. The name *Kulaite* is proposed for them.—The fishing banks between Cape Cod and Newfoundland, by Warren Upham. If a portion of the continental border from Cape Cod to the Grand Bank south east of Newfoundland could be uplifted, we should behold nearly as much diversity of valleys, ridges, hills, plateaus, and all the forms of subaërial land erosion, as is exhibited by any portions of the adjacent New England states and eastern provinces of Canada. The submerged channels of outlet from the Gulfs of Maine and St. Lawrence, and the less profound valleys that divide the fishing banks from each other, prove that this region during a comparatively late geologic time was a land area, its maximum elevation being at least 2000 feet higher than now.

Bulletin of the New York Mathematical Society, vol. iii. No. 4, January.—"Modern Mathematical Thought," the presidential address, delivered by Prof. Newcomb, before the New York Mathematical Society (pp. 95–107), has been printed in our columns (see NATURE, vol. xlix. pp. 325–329). "Recent Researches in Electricity and Magnetism" (pp. 107–111) is a review, by G. O. Squier, of Prof. J. J. Thomson's "Notes." The reviewer feels assured that this "supplementary" volume will take its proper place beside Maxwell's great treatise in the library of every true student of electrical science. "Notes" and "new publications" occupy pp. 112–118.

SOCIETIES AND ACADEMIES.

LONDON.

Physical Society, February 9.—Annual general meeting. Prof. A. W. Rücker, F.R.S., President, in the chair.—The annual report of the Council was read by the President. Dr. Atkinson read the Treasurer's Report, and also an obituary notice of the late Prof. Tyndall. The adoption of the Reports was moved by the President, and carried *nem. con.* Dr. Chichester Bell and Mr. Griffiths were appointed scrutators, and subsequently declared the following gentlemen duly elected to form the new Council:—President, Prof. A. W. Rücker, F.R.S. Vice-Presidents: Walter Baily, Major-General E. R. Festing, F.R.S., Prof. J. Perry, F.R.S., Prof. S. P. Thompson, F.R.S. Secretaries: H. M. Elder, 50 City Road, E.C., and T. H. Blakesley, 3 Eliot Hill, Lewisham, S.E. Treasurer: Dr. E. Atkinson, Portesbery Hill, Camberley, Surrey. Demonstrator: C. Vernon Boys, F.R.S., Physical Laboratory, South Kensington. Other members of Council: Shelford Bidwell, F.R.S., W. E. Sumpner, Prof. G. Fuller, J. Swinburne, G. Johnstone Stoney, F.R.S., R. E. Baynes, Prof. G. M. Minchin, L. Fletcher, F.R.S., Prof. O. Henrici, F.R.S., Prof. S. Young, F.R.S. Prof. Reinold proposed a hearty vote of thanks to the Lords of Committee of Council on Education, for the use of the rooms and apparatus in the Royal College of Science. This was seconded by Prof. J. V. Jones, and carried unanimously. Votes of thanks were similarly accorded to the auditors, Mr. A. P. Trotter and Mr. R. Inwards, on the motion of Mr. Watson, seconded by Prof. Fuller; and to the officers of the Society, on the motion of Dr. Barton, seconded by Mr. Trotter. At an ordinary science meeting then held, Mr. Owen Glynn Jones read a paper on the viscosity of liquids, and exhibited the apparatus used in his experiments. The method employed consists in measuring the speed at which a small sphere travels through the liquid under the action of gravity. As Prof. Stokes had shown, the velocity of a sphere falling in an infinite liquid becomes constant, this velocity being given by the equation

$$V = \frac{2}{9} g a^2 \frac{\sigma - \rho}{\mu},$$

where a is the radius of the sphere, σ its density, ρ the density of the liquid, and μ its viscosity. If sliding friction exists between the sphere and liquid, the equation becomes

$$V = \frac{2}{9} g a^2 \frac{\sigma - \rho}{\mu} \frac{\beta a + 3\mu}{\beta a + 2\mu};$$

where β is the coefficient of friction. In making the experiments, small spheres (usually of mercury) were allowed to fall through a burette containing the liquid, and the time taken to travel the distance between two marks about 50 c.ms. apart noted. The radii of the spheres being small, it was considered better to deduce this from the mass. Direct determination of such small masses being difficult, a larger mass (M) was taken, weighed, and divided into, say, ten or twelve parts, and the speed of falling of each part observed in a liquid of constant viscosity. The velocity V, with which a sphere containing the whole mass would have fallen, was deduced from the equation

$$V^{\frac{3}{2}} = \Sigma v^{\frac{3}{2}}.$$

Similarly, the mass of any part which falls with a velocity v is given by

$$m = \left(\frac{v}{V}\right)^{\frac{3}{2}} . M.$$

In this way the author had been able to determine the mass of a sphere weighing only about 0·003 grammes to four significant figures. Referring to experiments made with a view to ascertaining whether sliding friction existed, the author said the divergence from the simpler formula did not exceed experimental errors. In determining viscosity, changes of temperature were found to be of great importance, especially in the case of glycerine, whose viscosity varies as much as 10 per cent. for 1° C. Small differences of temperature between different parts of the liquid are, however, not very serious, provided the mean temperature be known, for the mean speed observed is shown to be that corresponding to the mean temperature. To determine viscosity accurately at a given temperature, very delicate thermometers must be employed. Most of the liquids experimented on were bad conductors of heat, and hence required considerable time for the temperature to become uniform. Differences in temperature could readily be detected by observing if the speed of descent of a small sphere varied at different parts of its path. The author suggested that this fact might be used to determine the thermal conductivity of liquids heated at the top by Forbes' method. The falling sphere would form a thermometer of almost infinitesimal thermal capacity. For most oils, spheres of water coloured with eosin could be employed to determine the viscosity. A water-drop of 1 mm. radius was found to fall one inch per hour in castor oil at 8° C. To determine the variation of viscosity with temperature a special apparatus was used, with which observations could be made in rapid succession by simply inverting the tube containing the liquid and the falling sphere. In Mr. Trouton's viscosity experiments, which were somewhat analogous to those described, surface tension complicated the results considerably; the author's aim had been to eliminate such disturbing influences. Prof. Everett, in a written communication, suggested that the motion of the liquid spheres be checked by using beads of quartz or glass. Lord Rayleigh pointed out, in a letter, that the formula employed related to a solid sphere, and thought it not legitimate to use it for liquid spheres, for the tangential forces at the surface would set the interior liquid in relative motion, and modify the resistance experienced. He also thought the existence of a finite coefficient of sliding friction between two fluids an impossibility. Mr. Watson said temperatures might be kept constant for days together by Ramsay and Young's vapour jacket. Dr. Sumpner thought the surface tension of such small spheres of mercury was so very large that they would act practically like solids. The want of solidity might be of importance when the two liquids were very nearly alike in density and other properties. Mr. Blakesley said that at high velocities the falling sphere might get a palpitating motion, in addition to the gradual descent, and this might introduce errors. Prof. Perry considered that the experiments on the velocity of a small sphere, and those of the two parts in which it was divided, which showed that $V^{\frac{3}{2}} = v_1{}^{\frac{3}{2}} + v_2{}^{\frac{3}{2}}$ proved the simple formula used to be correct. Mr. Boys inquired if any tests had been made on the constancy of dimensions of the spheres used. He would expect that in the case of water and oil, for example, that mutual contamination would take place. Speaking of the indirect method of determining the masses of small spheres, he thought direct weighings might be made, for, as the President and Prof. Poynting had shown, the balance might be immensely improved. Prof. S. P. Thompson suggested that small globules of aluminium or slag might be used. Dr. C. V. Burton thought Lord Rayleigh's criticism important, and that large corrections might be necessary. He failed to see how the large surface tension mentioned by Dr. Sumpner could prevent internal circulation. Mr. Trotter said Lord Rayleigh's point might be tested by using a sphere of oiled wax. Mr. Boys mentioned that Lord Rayleigh had shown in the case of soap rings that variation of surface tension due to stretching or compression produced stability. The same phenomena would probably retard internal circulation. The President said there was little doubt that internal circulation, as mentioned by Lord Rayleigh, would modify the velocity. In his reply, Mr. Jones said he could not imagine how in pure liquids internal motion in the falling spheres could be set up. In answer to Mr. Boys, he had found slight changes in the masses of the water spheres after being used many times, but this was a question of days. During an ordinary series of observation the dissipation was too small to be observed. After the meeting had been adjourned, Mr. Boys and Dr. Burton considered the question of internal circulation, and the latter pointed out that with perfectly liquid spheres there would be infinite slip, and the coefficient of sliding friction β would be zero. The velocity of descent would therefore be $\frac{3}{2}$ times that given by the first equation.

Geological Society, February 7.—W. H. Hudleston, F.R.S., President, in the chair.—Mr. C. J. Alford, in explanation of specimens of auriferous rocks from Mashonaland exhibited by him, stated that several of them were vein-quartz occurring as segregations in the slates, generally forming veins between the cleavage-planes. Another specimen was a mass of chromate of lead, with pyromorphite and other lead minerals, occurring in masses in decomposed and dislocated talcose slate in the Penhalonga Mine near Umtali, and probably resulting from the alteration of masses of galena by weathering, as a broken vein of galena was found in close proximity. This crocoisite was supposed to be a somewhat rare mineral, but he had found it and also the native red oxide, minium, in several places in South Africa. The most interesting specimen, was, however, a mass of diorite showing visible gold throughout the rock, an assay of which gave upwards of 130 ounces of gold per ton. From information obtained from the prospector who made the discovery, he gathered that the deposit was a dyke of diorite running for a considerable distance, about 8 feet in width, flanked on one side by granite and on the other by slates. There were extensive ancient workings extending to a depth of about 60 feet, and the prospecting shafts had not gone much below that depth, so not much information was obtainable at present. The diorite showed a development of epidote, but little or no quartz; and the gold appeared to enter in an extraordinary manner into all of the composing minerals. Mr. Alford hoped, after his next visit to Mashonaland, to be in a position to lay before the Society more definite information regarding these interesting rocks.—The following communications were read:—On some cases of the conversion of compact greenstones into schists, by Prof. T. G. Bonney, F.R.S. By the path leading from the Bernina Hospice to the Grüm Alp (Engadine) some masses of compact green schist are seen, intercalated in a rather crushed gneiss. They prove to be intrusive dykes modified by pressure. Microscopic examination of specimens from these revealed no trace of any definite structure indicating an igneous rock; a slice, cut from one of the masses within an inch or so of a junction, showed it to be a foliated mass of minute chlorite or hydrous biotite, with granules of epidote (or possibly some sphene) and of a water-clear mineral, perhaps a secondary felspar. An actual junction showed a less distinct foliation and some approach to a streaky structure. A slide from the middle of another dyke (about 18 inches thick) exhibited a more coarsely foliated structure and minerals generally similar to the last, except that it may contain a little actinolite and granules of hæmatite (?), and the clear mineral, in some cases, seemed to be quartz. The structure and most of the minerals appeared to be secondary. Chemical analysis showed the rock to have been an andesite. A specimen from a third dyke was generally similar, but was rather less distinctly foliated. A somewhat similar, but rather larger intrusive mass by the side of the Lago Bianco showed more actinolite and signs of primary felspar, with other minerals. Here the rock retained some likeness to a diabase. The resemblance of certain of these rocks to somewhat altered sediments is remarkable. The author considered the bearing of this evidence upon other and larger masses of "green schist" which occur in the Alps, and expressed the opinion that their present mineral structure may be the result of great pressure acting on more or less basic igneous rocks.—The Waldensian gneisses and their place in the Cottian sequence, by Dr. J. Walter Gregory. The lower part of the sequence of the Cottian Alps has been universally divided into three series, of which the lowest has been regarded as a fundamental (basal) Laurentian gneiss. It was the object of the present paper to show that this rock is really intrusive in character and Upper Tertiary in age. The writer endeavoured to prove this by the following line of argument:—(1) The gneiss consists of only isolated outcrops instead of a continuous band, and these occur at different positions and not always at the base of the schist series; (2) the gneiss is intrusive, because (*a*) it includes fragments of the overlying series instead of *vice versa*, (*b*) it sends off dykes of aplite into the surrounding schists, (*c*) it metamorphoses the rocks with which it is in contact, and (*d*) the schists are contorted near the junction; (3) the gneisses were further shown to be later than the igneous rocks intrusive into the "pietre verdi" series, as these never traverse the gneiss. No positive opinion as to the age of the overlying schists was expressed, though it was pointed out that the recent discovery of radiolarian muds in the series may necessitate their inclusion in the Upper Palæozoic. The freshness of the gneisses, the fact that these have not been affected by the early Tertiary earth-movements, and the absence of authentic specimens of the gneiss in the Cretaceous, Eocene, and Miocene conglomerates, renders their late Tertiary age highly probable. The nature of the contact-metamorphism and the origin of the gneissic structure were discussed, and a classification offered of the earth-movements in the Cottian Alps. A discussion followed, in which the President, Prof. Judd, Mr. Barrow, Prof. Bonney, Mr. A. M.

Davies, Mr. Vaughan Jennings, and Dr. G. J. Hinde took part. The author briefly replied.

PARIS.

Academy of Sciences, February 12.—M. Lœwy in the chair.—On a theorem connecting the theory of synchronisation with the theory of resonances, by M. A. Cornu. A demonstration is given leading to the theorem: "A verysmall periodic force, varying with the time according to any law capable of development by Fourier's series, is equivalent in its action on a vibrating system, damping slowly and of almost the same period, to the simple pendular force represented by the terms of the first order of the series." The general character of synchronisation is pointed out, and the necessity of considering it where resonance is an important property is insisted on.—New experiments on the production of artificial diamonds, by M. Henri Moissan.—On interior pressure in gases, by M. E. H. Amagat. The author defines interior pressure as $\pi = \left(T\frac{dp}{dt} - p\right)$ and traces its value for carbon dioxide, ethylene, oxygen, nitrogen, air, and hydrogen. With the more perfect gases, π as the volume decreases first increases to a maximum, and then decreases; the maximum for hydrogen is reached at a comparatively low pressure, and π for this gas continues decreasing through zero to a negative value. With ethylene and carbon dioxide the maximum has not been reached.—On the time of departure for the Iceland fishery, by M. Jean Sicard.—Note on the solar observations made at the Lyons Observatory Brunner equatorial) during the second quarter of 1893, by M. J. Guillaume.—On rectilinear congruences and on Ribaucour's problem, by M. E. Cosserat.—On a characteristic property of the linear element of spiral surfaces, by M. Alphonse Demoulin.—On some points in the theory of functions, by M. Emile Borel.—On a theorem concerning harmonic functions of several real variables, by M. G. D. d'Arone.—Researches on the mode of combustion of ballistic explosives, by M. Paul Vieille. The author has studied the character of explosions under pressure, and will publish the results in a coming paper.—On the conductibility of discontinuous conducting substances, by M. Edouard Branly. Two hypotheses appear to explain the experimental results:—(1) The insulator interposed between the conducting particles becomes a conductor by the passage of a current of high potential, and the observed phenomena characterise the conductibility of the insulating substance. (2) It may be regarded as demonstrated that it is not necessary for the particles of a conductor to be in contact to allow the passage of even a feeble electric current; the distance for which the conductibility persists depends on the energy of the anterior electrical effects. In this case, the insulator serves chiefly to maintain a certain interval between the particles.—On the fusibility of isomorphous saline mixtures, by M. H. Le Chatelier. Tables and curves are given showing the temperatures of crystallisation of varying mixtures of pairs of isomorphous salts, – $K_2CO_3 : Na_2CO_3$, – $Na_2SO_4 : K_2SO_4$, – $K_2CrO_4 : K_2SO_4$, – $Na_2SO_4 : Na_2CO_3$, – $K_2CO_3 : K_2SO_4$, – NaCl : KCl, – KI : KCl.—On the assimilation of gaseous atmospheric nitrogen by microbes, by M. S. Winogradsky.—On the antitoxic property of the blood of animals vaccinated against viper poison, by MM. C. Phisalix and G. Bertrand. If viper poison be mixed with certain proportions of the defibrinated blood of an inoculated animal it fails to poison on injection.—Researches on the anatomy and development of the female genital armatature in lepidopterous insects, by M. A. Peytoureau.—Observations on hypermetamorphosis or hypnodia among the cantharidiæ. The stage called pseudo-chrysalis, considered as a phenomenon of encystment, by M. J. Künckel d'Herculais.—Salivary glands of hymenoptera of the family of the Crabronidæ, by M. Bordas.—On some parasites of the Lepidodendra of Culm, by M. B. Renault.—Observations on the character of the relationship between platinum and its mother-rock, by M Stanislas Meunier. The author points out the agreement between the views of M. Inostranzeff (*C. R.* January 29) and his own previously published observations. The metallic platinum must have been deposited in the interstices of peridotic masses by the interaction of hydrogen and platinic chloride vapours at a red heat, much below the temperature of fusion of the rock.—On a bed of apophyllite in the environs of Collo (Algeria), by M. L. Gentil.—Eruption of the volcano Calbuco, by M. A. F. Noguès.—Remarks on the earthquakes in the island of Zante during 1893, by M. A. Issel.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

BOOKS.—The Student's Introductory Handbook of Systematic Botany: J. W. Oliver (Blackie).—A School Course in Heat 5th edition: W. Larden (S. Low).—Remarkable Comets, 2nd edition: W. T. Lynn (Stanford).—Celestial Motions, 8th edition: W. T. Lynn (Stanford).—The Voices of the Stars: J. E. Walker (Stock). The Universal Electrical Directory, 1894 (Alabaster).—Bourne's Handy Assurance Directory, 1894: W. Schooling (London).—Social Evolution: B. Kidd (Macmillan).—Manures and the Principles of Manuring: C. M. Aikman (Blackwood).—Société d'Encouragement pour l'Industrie National Annuaire pour l'Année 1894 (Paris).—A Memorial Work, chiefly on Botany and Zoology, in Commemoration of the Ninetieth Anniversary of Keisuke Ito, 2 vols. T. Ito (Nagoya, Japan.

PAMPHLETS.—Imitation: a Chapter in the Natural History of Consciousness: Prof. J. M. Baldwin.—Stonyhurst College Observatory. Results of Meteorological and Magnetical Observations, 1893 (Clitheroe).—Erinnerung an Eilhard Mitscherlich, 1794–1863 (Berlin).—Guide to the Examinations in Elementary Agriculture and Answers to Questions, Elementary Stage, 1884-93 (Blackie).—The Internal Work of the Wind: S. P. Langley (Washington.—Revision of the Japanese Species of Pedicularis, L.: T. Ito (Nagoya, Japan).—Note on the Burmanniacee of Japan: T. Ito (Nagoya, Japan).—The Development of the Skeleton of the Limbs of the Horse: Prof. J. C Ewart.

SERIALS.—Journal of the Chemical Society, February (Gurney and Jackson).—Memoirs and Proceedings of the Manchester Literary and Philosophical Society, 1893-4. Vol. viii. No. 1 (Manchester).—Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie, Achtzehnter Band, 1 and 2 Heft (Williams and Norgate).—Brain, part 64 (Macmillan).—Engineering Magazine, February (New York).—Medical Magazine, February (Southwood).—Verhandlungen der Gesellschaft für Erdkunde zu Berlin, Band xx. No. 10 (Berlin).—American Journal of Mathematics, Vol. xvi. No. 1 (Baltimore).—Proceedings of the Royal Society of Edinburgh Session 1892-3. Vol. xx. pp. 97-160 (Edinburgh).—Transactions of the Royal Society of Edinburgh, Vol. xxxvii. parts 1 and 2 (Edinburgh).—Himmel und Erde, February (Berlin).—Bollettino della Societa Geografica Italiana, Serie 3. Vol. 6. fasc. 10 and 11 (Roma).—Indian Museum Notes, Vol. vii. No. 7 (Calcutta).—Journal of the Asiatic Society of Bengal, Vol lxii. part 2. No. 3 (Calcutta).—Journal of the Anthropological Institute, February (K. Paul).—Harvard University Bulletin, January.—American Meteorological Journal, February (Ginn).

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